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# REVISED
# AIR QUALITY STUDY OF GREEN ENERGY PARTNERS/STONEWALL SOLAR AND NATURAL GAS-FIRED POWER PLANT AT LEESBURG, VA



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**ATTACHMENT 5**

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## SECTION 1 – INTRODUCTION

Green Energy Partners/Stonewall Andrews Community Investment Corporation (Green Energy) is proposing to build a nominal 981 megawatt (estimated rating at International Organization for Standardization (ISO) conditions of 59°F) power plant using natural gas, steam and solar energy on a 90 acre secured parcel of land in Loudoun County, Virginia. The plant is planning to purchase up to about 5 million gallons per day of treated wastewater from the Leesburg municipal treatment plant that is presently discharging into the Potomac River or reservoir water from the new Loudoun Water treatment system. The water will be used as cooling water and process water to produce steam for the facility. The capacity of the plant (without solar) will be approximately 980 megawatts total, with approximately 2/3 being produced for intermediate or base load operation using the combined-cycle units and 1/3 being produced for peaking purposes. Electricity would be available to be purchased by among others, Dominion Virginia Power and Northern Virginia Electric Cooperative, the two utilities presently providing power to Loudoun County.

The plant will be located south-southeast of the Town of Leesburg Airport and north of the Dulles Toll Road. The site has access to two natural gas pipelines and to existing Dominion high-voltage transmission lines. The plant will be designed with a low profile, i.e. the exhaust stacks and supporting structures will be lower than the existing high voltage transmission towers running through the area. The plant will use highly efficient gas combustion turbine generators and a steam turbine generator to produce the power. This technology is the most efficient in the world today for producing energy from fossil fuels. In addition to the gas turbines, approximately 10 acres of photovoltaic solar panels will be installed for producing electricity. Considering the climate of the area, the 10 acres of solar panels will be able to average a production rate of at least one (1) megawatt of power.

A concern with the building of any fossil fueled power plant is the effect on the environment, with particular concern for the air pollution resulting from fuel combustion. In this regard the regulatory agencies have adopted stringent air emission limitations for this industry since the inception of the Clean Air Act in 1970. The industry continues to be regulated by the US Environmental Protection Agency (US EPA) and other world health agencies because of its significant contribution to community health concerns, long range transport of pollutants and the discharge of greenhouse gases. This plant will be designed with the most advanced air pollution control technology to reduce air discharges found on any plant in the US, western Europe and Japan.

MACTEC Engineering and Consulting, Inc. has provided environmental consulting services to government and industry for more than 40 years. The firm has provided consulting services to Loudoun County, Fairfax County, the City of Alexandria, Virginia and the Commonwealth of Virginia as well as Dominion Power, Constellation Energy, UniStar Nuclear Energy and other industrial clients in Virginia, the US and throughout the world. MACTEC has also assisted the US EPA in the development of air dispersion models, better stack testing methods (especially those associated with the formation of

secondary pollutants such as sulfates and nitrates from power plants), and permitting procedures to allow for continued growth in those highly polluted non-attainment areas of the US, and in the evaluation of the impacts associated with hazardous air pollutants or the discharges of odorous matter from industrial sources.

MACTEC was asked to conduct an air quality study of the 981 megawatt power plant located near Leesburg, Virginia using the same analytical tools that are required for securing environmental permits from the regulatory agencies. This report provides a detailed description of potential emissions from the gas turbine units and the cooling tower due to the loss of small particles during the evaporation of water. Other ancillary sources are also identified and included in the analysis. The emission rates reflect the controls being proposed for the facility and as stated above are the best in the US and the rest of the world. The layout, process description and emission rates are described in detail in Section 3 of this document.

Section 2 contains the summary and conclusions reached in the course of this investigation. Section 3 describes the equipment to be installed and their potential air emissions. In Section 4 we have described the analytical tools that were used to relate air emissions discharged from the plant to the expected ground level concentrations at the property line, in the communities surrounding the plant and at distances of 50 kilometers from the plant. The dispersion models and the meteorological data set used for this analysis are discussed in Section 4. Additionally, a model was run to determine the dissolved solids deposition from the cooling tower plume because of the possible use of the treated wastewater in that process. In Section 5 we present a detailed discussion of the modeled results. In that section, we also compare model predictions combined with background or existing air quality measurements in the Leesburg area to the Virginia and US EPA air quality standards. The analytical tools and the evaluation methodology are identical to those required by the regulatory agencies in determining whether a construction permit can be issued for a facility such as this one.

The emissions data presented in this report have been updated from the data in the July 2009 version of the report submitted previously. The estimates were revised to account for changes in the equipment specifications, to include the contribution to emissions from support equipment needed to operate the facility, and to correct an error made in the annual emission estimates for the simple cycle turbines. The expected increase in emissions and air quality impact due to these revisions is slight, and the overall expected impact remains miniscule. The emissions estimates in this revision represent the worst-case emissions levels that will be presented to the Virginia Department of Environmental Quality (DEQ) as the basis for establishing permit limits.

This report was prepared under the direction of Michael E. Lukey, P.E. William M. Burch, P.E. and Malay Jindal were the two other principal investigators who participated in the analysis. The work was completed at MACTEC's northern Virginia offices.

## SECTION 2 – SUMMARY OF RESULTS

The results of this investigation are summarized in the following paragraphs.

1. Once the plant is built and is operating under the maximum emissions scenario, there will be a negligible effect on air quality levels at the plant property line, in any of the communities surrounding the plant, in the Town of Leesburg, or at any other receptors downwind from the source. Assuming a stack height of 120 feet as the basis of the study, the maximum predicted ambient concentrations of all criteria pollutants are well below the levels that the US Environmental Protection Agency has set as health standards and far below the levels that the US EPA deems to be significant. For example, the US EPA health standard for nitrogen oxides (NOx) is 100 $\mu g/m^3$ and the significance level is 1.0 $\mu g/m^3$, while the maximum predicted concentration for the entire study area is 0.7 $\mu g/m^3$ (all annual averages).

2. The plant will utilize air pollution control equipment that represents the best technology available in the US and the rest of the world today. For the two natural gas fired combined cycle units, Green Energy will use an oxidation catalyst to control carbon monoxide (CO), and a selective catalytic reduction system (SCR) along with dry low-NOx combustion to provide a 98+% reduction in nitrogen oxides emissions. This control system is deemed to be the best technology available by the US EPA and the South Coast Air Quality Management District in Los Angeles, CA (considered by many to be the premier regulatory agency for controlling smog in the US). The peaking units will also utilize SCR, if possible, to control NOx emissions during steady-state operating conditions. The selection of natural gas power systems will mitigate greenhouse gas emissions.

3. The Leesburg, VA area is in compliance with all US EPA and VA ambient air quality standards except for the pollutant ozone. The Washington, DC metropolitan area is designated non-attainment, i.e., exceeds the health standard, for this pollutant only. Ozone is associated with emissions from cars and other sources in and around major metropolitan areas. The Green Energy facility will emit nitrogen oxides that are precursors for the formation of ozone in the presence of sunlight mainly during the hot summer months. Nitrogen oxides emitted by the proposed facility in Leesburg will contribute, albeit slightly, to the formation of ozone downwind in the eastern DC suburbs. The permitting procedures for allowing new emissions to occur in these non-attainment areas require that companies such as Green Energy offset their increase in emissions with reductions in emissions from existing operations such that there will be a net reduction in NOx emissions within the DC metropolitan area. Thus, by obtaining offsets, Green Energy will help improve the overall ozone non-attainment issue for the Washington, DC area.

4. The analytical tools used to conduct this investigation represent the state-of-the-art for determining air quality effects of new sources on surrounding communities. The US EPA's AERMOD dispersion model was used along with hourly meteorological data from Washington Dulles International Airport. Upper air data from Dulles was also used in AERMOD for predicting ground level concentrations of criteria pollutants. The SACTI model developed by the Electric Power Research Institute was used to estimate the plume length and particle deposition from the cooling tower. The current or baseline air quality levels for the criteria pollutants were obtained for the year 2008 from nearby monitoring stations. A comparison to air quality standards needed for approval by the regulatory agencies was also made. Technical obstacles are not anticipated for securing DEQ/US EPA approvals.

5. The expected ground level concentrations from the operation of the new 981 megawatt power plant are miniscule. The highest pollutant concentrations predicted for this facility will be about one half of one percent of the Virginia and EPA ambient air quality standards for any pollutant for any averaging period. The highest predictions occurred at the property line, so pollutant concentrations in any surrounding communities will be significantly less than the highest values used for the regulatory approval process. For nitrogen oxides, the maximum annual concentration at the property line was 0.7 $\mu g/m^3$ and at Leesburg and Ashburn the concentration was 0.02 $\mu g/m^3$.

6. The water vapor plume from the cooling tower will be visible within the plant boundary virtually at all times that the plant is operating but is only expected to extend to the plant boundary to the northwest and southwest of the cooling tower for a total of 5 hours per year. At Leesburg Airport the plume is expected to be noticed overhead for 8 minutes per year according to the model. Although the water used for cooling contains significant amounts of dissolved solids because it comes from a wastewater treatment plant, the particulate emissions from the tower are low. The size of the water droplets (60 microns or less) released from the tower is also small because of the use of highly efficient mist eliminators. As such, there are no water droplets containing particles that are deposited on or off the plant property. The water droplets that remain suspended in the air will travel with the wind and eventually evaporate downwind. Any entrained particles will also remain suspended and will travel even farther with the wind. These particles, like all other particles that enter the atmosphere, will eventually come to the earth's surface after they combine with other particles or become attached to water molecules and fall as precipitation.

7. In sum, the Green Energy hybrid power plant will have an insignificant effect on the air quality levels at the property line or in any of the surrounding communities. The current air quality is very good and will remain very good after the new plant is built and begins operation. Because there will be miniscule effects on air quality levels and the best available control technology for criteria pollutants will be used, regulatory approval is expected. The emission offsets

needed to help mitigate the ozone non-attainment problem in the Washington, DC area should be easily obtainable. Greenhouse gas emissions will be approximately 35% of GHG emissions from a new coal fired power plant and an even lower percentage of GHG emissions from an older equivalent sized coal plant such as the Dickerson plant in Maryland. Finally, other harmful emissions associated with coal plants such as mercury and heavy metals will never occur with the proposed Green Energy plant.

## SECTION 3 – PROJECT DESCRIPTION

Green Energy intends to construct a new energy facility south of Leesburg, Virginia. The site location is north of the Dulles Greenway (Route 267) at Sycolin Road (Route 643) in Loudoun County. The new facility will generate electric power from the operation of two combustion turbines and a steam turbine in combined-cycle, two simple cycle combustion turbines, and a PV solar farm. The turbines will be fired by natural gas only. Cooling water is proposed to be treated effluent from the Town of Leesburg's wastewater treatment plant or reservoir water from Loudoun Water's treatment plant. The site was chosen because of its proximity to two natural gas transportation lines, three electric transmission lines, and cooling water supply. The preliminary layout of the new facility is shown on Figure 3.1.

This section provides a description of the major components and support equipment for the planned facility followed by a summary of the potential air emissions from operation of the site.

### MAJOR EQUIPMENT

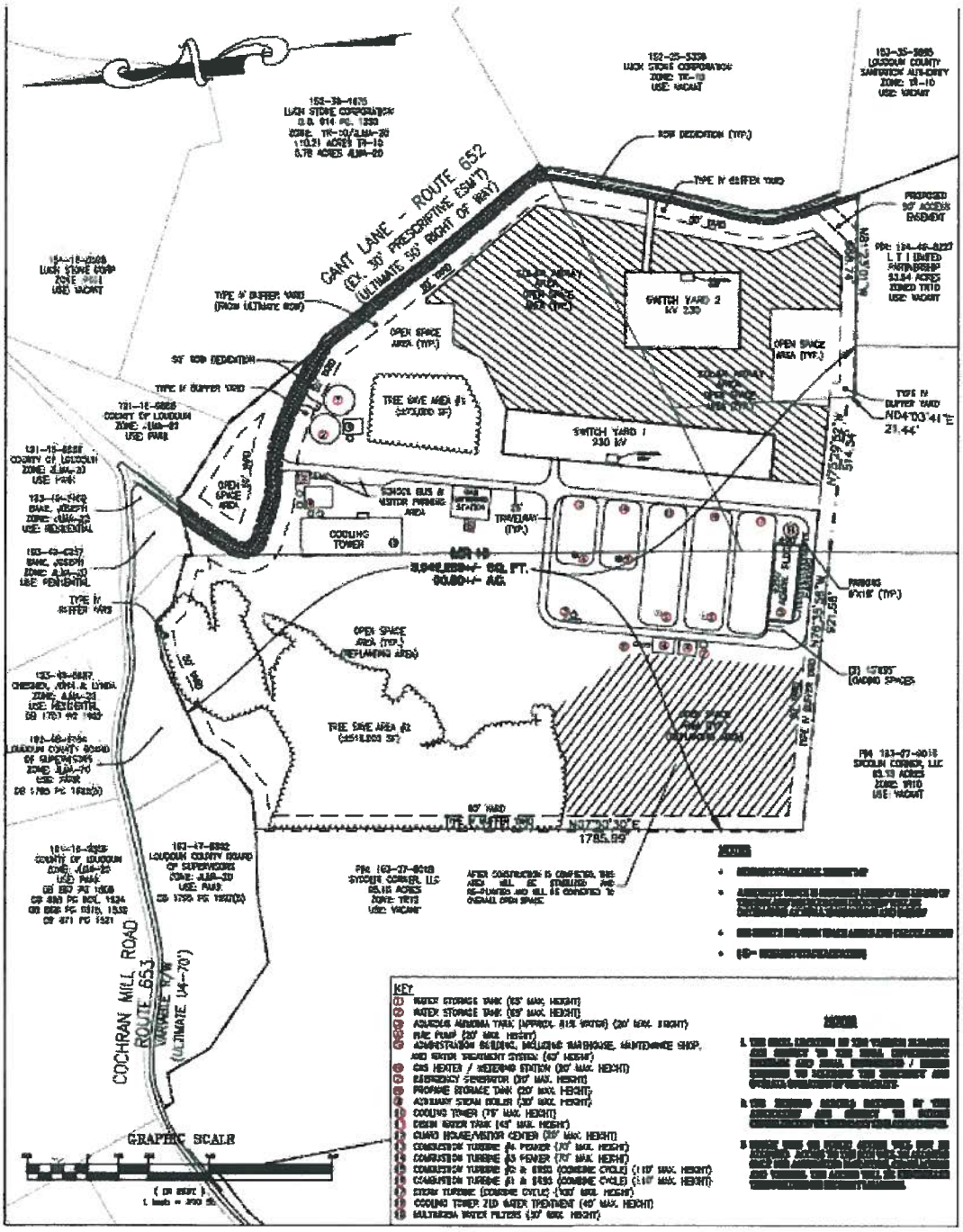
The major equipment comprising the new energy facility includes four combustion turbines and generators, one steam turbine and generator, two heat recovery steam generators (HRSG) with supplemental duct firing and exhaust stacks, the supporting cooling towers, and the solar farm.

Natural Gas Fired Turbines

The facility will utilize four combustion turbines each rated at approximately 197 MW at 59°F to generate power. Two turbines will operate in combined-cycle mode. These combustion turbines will drive electric generators. Hot exhaust gases from the two combustion turbines will each exhaust through a HRSG with supplemental duct firing, generating steam to drive a single steam turbine and electric generator, thus increasing the total power produced to approximately 586 MW at ISO temperature of 59°F. The units will include state-of-the-art combustion technology and control equipment to limit air pollutant emissions. Natural gas is a clean burning fuel that when combusted generates minimal particulate and sulfur oxide emissions. Natural gas has the lowest greenhouse gas (GHG) emission rate of all fossil fuels such as coal or fuel oil.

The generation of emissions of nitrogen oxides (NOx) will be limited by the use of a dry low-NOx combustion system. NOx emissions will be further controlled by the application of a selective catalytic reduction (SCR) control system on the exhaust from the HRSG. The SCR system will rely on aqueous ammonia injection. Aqueous ammonia consists of a solution of water (81%) and ammonia (19%). The rate of ammonia injection will be well-controlled to effectively reduce NOx and limit ammonia "slip" or release to the air during operation of the SCR. Carbon monoxide (CO) emissions will be reduced by use of a CO oxidation catalyst. The use of these controls match the most stringent controls required of any combined cycle combustion turbine in the United States. The

## Figure 3.1 Preliminary Facility Plot Plan



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Combined-cycle units are expected to operate intermittently or continuously based on seasonal demand.

Two of the four combustion turbines will operate as simple-cycle peaking units, only operating during periods of high demand for electric power. The peaking units will also be designed to limit their environmental impact through the use of a dry low-NOx combustion system and SCR (if determined feasible for application to a peaking unit) to control NOx emissions.

Each of the four combustion turbines will vent through an exhaust stack. The exhaust stack heights will be designed based on good engineering practice to eliminate the potential for downwash and increased downwind air quality effects. The exhaust stacks will be low in profile, visually blending in with and no higher than the existing adjacent power transmission towers that cross the site.

Cooling Tower

Heat generated from the operation of the steam turbine condensers will be collected by cooling water and transferred to the ambient air through the use of a mechanical draft, evaporative cooling tower. A low-profile, 10-cell tower is planned. The source of water for the cooling tower will be treated wastewater from the Leesburg Wastewater Treatment Plant or reservoir water from the Loudoun water treatment facility. The water will be recirculated through each cell crossing paths with an ambient air stream drawn up by fans through the recirculating water. Heat will be dissipated as a result of evaporation of a portion of the cooling water. Water losses to the air stream or "drift" will be minimized through the use of high-efficiency mist eliminators. The mist eliminators also control any deposition resulting from any dissolved solids in the drift and the release of any chemical additives used to prevent foam formation and algae growth in the tower. A portion of the cooling water will be purged, filtered to remove solids, and recycled to the cooling tower. An additional benefit will be a net reduction in the amount of treated wastewater released to the Potomac River and Chesapeake Bay by the Leesburg treatment plant.

Solar Farm

An array of photo-voltaic (PV) panels will be erected on the eastern portion of the site. Approximately 10 acres will be committed as a "Solar Farm" to generate an additional 1 MW of power. The PV panels convert solar energy (i.e., sunlight) directly into electrical energy. PV panels have historically been used in the residential and commercial sector, with several newer projects underway or in the planning phase for producing wholesale power by utilities.

## SUPPORT EQUIPMENT

Support equipment required for the operation of the facility includes a small auxiliary steam boiler, an emergency power generator, and an emergency fire pump. These units will be natural gas or propane fired.

## SUMMARY OF POTENTIAL EMISSIONS

Air emissions will result from the combustion of natural gas by the combustion turbines and natural gas or propane by the support equipment, and from the cooling tower drift. These are the only sources of air emissions at the facility. The potential emissions from these sources are summarized below. A comparison of the estimated greenhouse gas carbon dioxide produced by the Green Energy facility with that of a similarly sized coal fired power plant is also presented.

Emissions from Operation of Combustion Turbines

The combustion of natural gas by the turbines will result in the release of carbon monoxide (CO), volatile organic compounds (VOCs), nitrogen oxides (NOx), particulate matter (PM/PM-10), sulfur oxides ($SO_2$) and ammonia ($NH_3$). The emission estimates for the turbines are based on data from a potential turbine vendor. For the combined cycle units, as reported by the vendor, the SCR systems were assumed to be capable of maintaining a 2 ppm or lower NOx concentration in the exhaust from the HRSG unit. The 2 ppm level was identified in several recent best available control technology determinations by air pollution control agencies for combined cycle units. The ammonia "slip" or release rate for estimating emissions was estimated to be 5 ppm or less by the vendor. To estimate worst case emissions, the combined cycle units were assumed to operate around the clock (8,760 hours per year).

Depending on the hourly load demand from the dispatcher, the simple-cycle peaking units may not be able to use SCR for controlling NOx emissions. These control units require steady state operating conditions in order to be effective and prevent ammonia slip. Peaking units may be used at a constant load for many hours during the day or they may be changing loads constantly according to the dispatch. Green Energy plans to use the SCR if vendors will guarantee their use for conditions involving swing loads and under predefined continuous load conditions. Because none of these operating conditions can be defined at this time, this analysis assumed that the simple cycle units would use dry low-NOx combustion as the control system. The NOx concentration in the exhaust was estimated by the vendor to be 9 ppm. Due to their use as peaking units, the simple cycle units were assumed to operate a maximum of 2,000 hours per year.

The potential emissions from the operation of the turbines and other sources are summarized in Table 3.1.

**Table 3.1 Summary of Potential Air Emissions from New Energy Facility**

| Pollutant/Unit | One Combined Cycle (CC) Unit | One Simple Cycle (SC) Unit | Four Units (2 CC + 2 SC) | Cooling Tower | Support Units | Annual Total |
|---|---|---|---|---|---|---|
| **CO** | | | | | | |
| Lbs/hour | 11.0 | 34.6 | 91.2 | | 27.5 | |
| Tons/year | 45.1 | 33.0 | 156.2 | | 32.4 | 198.0 |
| **PM/PM-10** | | | | | | |
| Lbs/hour | 14.4 | 10.0 | 48.8 | 1.7 | 0.7 | |
| Tons/year | 63.1 | 10.0 | 146.1 | 7.4 | 2.5 | 163.8 |
| **NOx** | | | | | | |
| Lbs/hour | 18.0 | 72.2 | 180.4 | | 14.3 | |
| Tons/year | 74.5 | 68.5 | 285.9 | | 18.8 | 319.9 |
| **$SO_2$** | | | | | | |
| Lbs/hour | 1.5 | 1.4 | 5.8 | | 0.1 | |
| Tons/year | 5.4 | 1.1 | 13.0 | | 0.2 | 13.8 |
| **VOC** | | | | | | |
| Lbs/hour | 6.2 | 3.3 | 19.0 | | 5.7 | |
| Tons/year | 25.4 | 3.2 | 57.2 | | 3.1 | 63.3 |
| **Ammonia** | | | | | | |
| Lbs/hour | 14.8 | - | 29.6 | | | |
| Tons/year | 64.7 | - | 129.5 | | | 136.0 |

NOTES:

1) For turbines, maximum hourly emissions based on vendor data for worst-case winter conditions (i.e., 20°F); annual estimates based on vendor data for ISO conditions (representative of annual average conditions, i.e., 59°F versus Dulles historical data annual average of 54°F) and

2) Annual potential emission estimates include a 5% safety factor to allow for potential adjustments to data during finalization of plant design.

Emissions from Operation of Cooling Tower

The release of pollutants from the operation of cooling tower results from cooling tower drift. The drift is fine water droplets that pass through the cooling tower's drift (mist) eliminators that are necessary to minimize water losses. They also serve to abate visible plumes. The drift contains dissolved solids and chemical amendments added to the cooling tower water. Upon release, the drift (water) evaporates and the dissolved solids in the drift solidify as a particulate containing any non-volatile chemicals that may have been added to the cooling water (such as biocides and anti-foaming agents required for tower performance).

Emissions from cooling towers are estimated based on a US EPA procedure in AP-42 (*Compilation of Air Pollutant Emission Factors,* Section 13.4, January, 1995). The calculation is a mass balance based on the tower's water recirculation rate, the drift

eliminator efficiency, and concentration of contaminants in the cooling tower water that becomes drift. The total dissolved solids (TDS) level in the tower water is determined from the TDS level in the influent times the cycles of concentration (operating parameter for recirculation of water within tower).

The new energy plant's cooling tower will be controlled by highly efficient drift eliminators with a design release rate of 0.0005 percent of the water recirculation rate. A review of drift eliminators used by other recently permitted cooling towers found a 0.0005 percent efficient eliminator represents the most stringent control applied at cooling towers for new energy plants. The cooling tower is expected to operate based on 5-6 cycles of concentration. The influent TDS concentration was estimated to be 600 mg/liter based on the analysis of an effluent sample from the Leesburg Wastewater Treatment Plant. The cooling tower recirculation rate is estimated at 187,400 gallons per minute for all 10 cells combined.

Chemical additives will be used in the operation of the cooling tower. This includes biocides (e.g., sodium hypochlorite) to prevent biological growth, defoaming agents, and dispersing agents. The additives are dispersed in the recirculating cooling tower water and maintained at part per million levels. They are released in the cooling tower drift at that same concentration, resulting in a negligible emission rate.

Estimates of emissions from the operation of the cooling tower are presented in Table 3.2.

**Table 3.2 Emission Estimates for Cooling Tower Serving New Energy Facility**

| **Particulate Emissions** | | |
|---|---|---|
| Recirculation Rate | Gallons/Minute | 187,400 |
| Drift Eliminator Efficiency | % of Recirculation Rate | 0.0005 |
| Cycles of Concentration | Number | 6 |
| Influent TDS | Mg/liter | 600 |
| Drift Loss | Gallons/hour | 56 |
| PM/PM10 Emissions | Lbs/hour | 1.7 |
| | Tons/year | 7.4 |
| **Tower Chemical Use** | | |
| Biocide Concentration | ppmw | 1 – 2 |
| Release in Drift | Lbs/hour | < 0.001 |
| Dispersing Agent Concentration | ppmw | 0.1 - 1.0 |
| Release in Drift | Lbs/hour | <0.0005 |
| Antifoaming Agent Concentration | ppmw | 0.01 – 0.1 |
| Release in Drift | Lbs/hour | <0.0001 |

Greenhouse Gas Emissions

The combustion of natural gas will generate greenhouse gases (GHG). The most significant GHG is carbon dioxide ($CO_2$). However, the potential GHG footprint from the new Green Energy facility will be significantly smaller than that of other fossil-fuel fired energy plants of the same comparable size. This will occur as a result of the use of natural gas and the high efficiency (low heat rate) associated with the combustion turbines. Table 3.3 provides a comparison of the potential $CO_2$ emissions from the new energy facility's combined cycle and simple cycle combustion turbines with the $CO_2$ generation from a similarly sized coal-fired facility. The $CO_2$ emission rates are based on emission factors provided by US EPA in AP-42. The estimated hourly $CO_2$ emission from Green Energy is significantly lower than that of a similarly-sized coal fired unit. Thus, the use of natural gas-fired combustion turbines provides a significant benefit in reducing GHG generation from future power generation.

**Table 3.3 Greenhouse Gas Emissions from Proposed New Energy Facility in Comparison to Coal Fired Power Plant**

| | | Comparably Sized Coal-Fired Unit | New Energy Facility | | |
|---|---|---|---|---|---|
| | | | Two Combined Cycle (CC) Units | Two Simple Cycle (SC) Units | All Four Units (2 CC + 2 SC) |
| Generating Capacity | MW | 900 | 600 | 300 | 900 |
| Heat Rate | BTU/kW (lower heating value) | 10,000 | 6,200 | 9,100 | |
| Heat Input | MMBtu/hour | 9,000 | 3,700 | 2,700 | 6,400 |
| Fuel Rate | Tons/hour | 360 | | | |
| | MMCF/hour | | 3.65 | 2.68 | 6.32 |
| $CO_2$ Emissions | Tons/hour | 1,111 | 219 | 161 | 379 |



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## SECTION 4 – DEMONSTRATION OF NO EFFECT ON AIR QUALITY IN SURROUNDING COMMUNITIES

For more than 75 years governmental agencies have been using mathematical dispersion models to predict the changes in ground level concentrations resulting from the discharges that occur from stacks. Virtually all models require an hour by hour meteorological dataset of the wind direction, wind speed, temperature and cloud cover in order to make the hourly predictions at ground level. Once released into the air the local meteorology determines the fate of a pollutant. A receptor grid is used to assess the effect on air quality in a study area. The receptor is a mathematical point in the x-y plane where the model provides a prediction. By using several hundred receptors to cover the study area, one can develop isopleths showing the air quality effects of source emissions on the area. That is the procedure used in this analysis.

### DISPERSION MODELING ANALYSIS

This section describes the dispersion models, meteorological data and source data used to complete the analysis of air quality impacts.

Dispersion Models

The current state-of-the-art model jointly developed by US EPA and the American Meteorological Society (AMS) for industrial source applications is called the AMS EPA Regulatory Model, or AERMOD. This model was developed using field measurements and has been extensively evaluated against additional field observations from various locations. MACTEC supported US EPA in this model development and evaluation effort. Based on MACTEC's evaluation of the model, US EPA found AERMOD to perform far better than other models and therefore adopted it as a guideline model for industrial source applications. AERMOD is a versatile model, i.e., it can simulate emission plumes from various types of sources including stacks, it can model single or multiple sources at once, it can simulate aerodynamic downwash caused by nearby buildings, and it can predict pollutant concentrations at multiple receptor points located all around the compass in a single run of the model. AERMOD was selected for calculating pollutant concentrations because it is the best suited model for this application and is recommended by US EPA.

The proposed facility will include one cooling tower with up to 10 cells (12 cells were conservatively assumed for the modeling) that will provide cooling water for the steam turbine condenser. By their nature, cooling towers emit water vapor, i.e., wet plumes consisting of tiny water droplets or mist. Any solids that are dissolved in the water are also emitted along with the mist, act as a gas and are mostly transported offsite. If the particles are large they may be deposited in close proximity of the cooling tower. The size of the particle discharged mainly depends on the drift eliminator efficiency. With the higher mist eliminator efficiency, one would expect a fewer number of particles to be deposited. The model used for this analysis is called the Seasonal-Annual Cooling Tower Impact, or SACTI, model. The SACTI model was developed by the Electric

Power Research Institute (EPRI) specifically to assess wet cooling tower plumes. It is a probabilistic model in that it predicts the probability of occurrence of certain conditions such as fogging, icing and visible plumes. It can also calculate the expected rate of particle deposition due to the cooling tower emissions.

A significant amount of heat is rejected from fossil fuel fired plants through the cooling tower using the evaporative process. Because of this, a water vapor plume will be visible virtually all of the time. However, the length and the height of the water vapor plume will vary depending on meteorological conditions, with the most visible plumes occurring on the coldest days of the year. Furthermore under certain meteorological conditions, the wet cooling tower plume can be visible beyond the property line and can cause fogging and icing effects on nearby ground surfaces. The proposed cooling tower was modeled using SACTI to assess the probability of the plume traveling offsite and also evaluate the potential for any ground-level fogging or icing events to occur. Additionally, SACTI was used to define the height of the water vapor plume and predict any particle deposition effects.

Meteorological Data

All models require input of meteorological data in order to simulate plume transport downwind from the source. Typical meteorological parameters include wind direction, wind speed, temperature, cloud cover and mixing height, i.e., the height of the atmospheric layer closest to the ground where the plume mixing occurs. All of these parameters are routinely measured by the National Weather Service (NWS) at most major airports. Given the proximity of the Washington Dulles International Airport, data from the NWS station at that airport are considered to be representative of local meteorology and were used in this analysis. US EPA modeling guidelines recommend the use of five consecutive years of meteorological data in order to capture the range of possible meteorological conditions. Five full years of data were obtained from the US EPA website and were used in this analysis.

Figure 4.1 shows a windrose for the five years of modeled meteorological data. A windrose is a chart depicting the frequency of occurrence of various wind directions and wind speeds. The windrose shows that the predominant wind direction is from the south with a frequency of about 13 percent of the time, while significant winds also occur from the northwest and north-northwest directions at approximately 10 percent and 9 percent, respectively. While on a given day the winds can be from any direction, the windrose indicates that there is a larger probability of plumes from the plant to be transported toward either the north (due to winds from the south) or the southeast (due to winds from the northwest).

Source Data

The proposed facility will consist of two combined-cycle combustion turbines with supplemental duct firing that will be used as intermediate or baseload units, and two simple-cycle combustion turbines that will be used as peaking units. The source data

required by AERMOD include the source location, pollutant emission rates, and physical stack parameters such as stack height, stack diameter, exhaust temperature, and exit velocity of the plume coming out of the stack. Table 4.1 provides a listing of these modeled parameters and emission rates for both types of turbines.

The cooling tower was modeled as two rows aligned parallel to each other with six cells in each row. Each cell will employ highly-efficient, state-of-the-art mist eliminators that will allow no more than 0.0005 percent of the circulating water to be emitted. The SACTI model requires the location, orientation and physical parameters of the cooling towers, the amount of heat dissipated by the cooling system, the emission rate of water and the emitted droplet size distribution, and the concentration of dissolved solids in the cooling water. Table 4.2 provides these parameters for the proposed cooling tower.

**Table 4.1 Source Parameters for AERMOD Modeling Analysis**

| Parameter | Combined-Cycle Turbine (Data for each of two units) | Simple-Cycle Turbine (Data for each of two units) |
|---|---|---|
| Stack Height (ft) | 120 | 120 |
| Stack Diameter (ft) | 12 | 18 |
| Exhaust Temperature (°F) | 172 | 1,085 |
| Exit Velocity (ft/min) | 9,373 | 10,169 |
| Max. Annual Operation (hrs) | 8,760 | 2,000 |
| Max. Hourly Emissions (lb/hr) | | |
| Nitrogen Oxides | 18.0 | 72.2 |
| Carbon Monoxide | 11.0 | 34.6 |
| Particulate Matter | 14.4 | 10.0 |
| Sulfur Dioxide | 1.3 | 1.2 |

**Table 4.2 Source Parameters for SACTI Modeling Analysis of Cooling Tower**

| Parameter | Value |
|---|---|
| No. of Rows / No. of Cells per Row | 2 / 5 |
| Exhaust Height / Diameter (ft) | 65 / 33 |
| Tower (row) Dimensions (ft) (L x W x H) | 375 x 125 x 50 |
| Total Heat Dissipated (MW) | 482 |
| Total Air Flow (lb/min) | 1,142,545 |
| Water Recirculation Rate (gal/min) | 187,400 |
| Drift Elimination Efficiency | 0.0005% |
| Total Dissolved Solids (ppm) | 600 |
| Cycles of Concentration | 6 |
| Droplet Size Distribution (diameter) | |
| 10 μm | 13.0 % |
| 20 μm | 18.5 % |
| 30 μm | 24.1 % |
| 40 μm | 22.2 % |
| 50 μm | 16.7 % |
| 60 μm | 6.0 % |

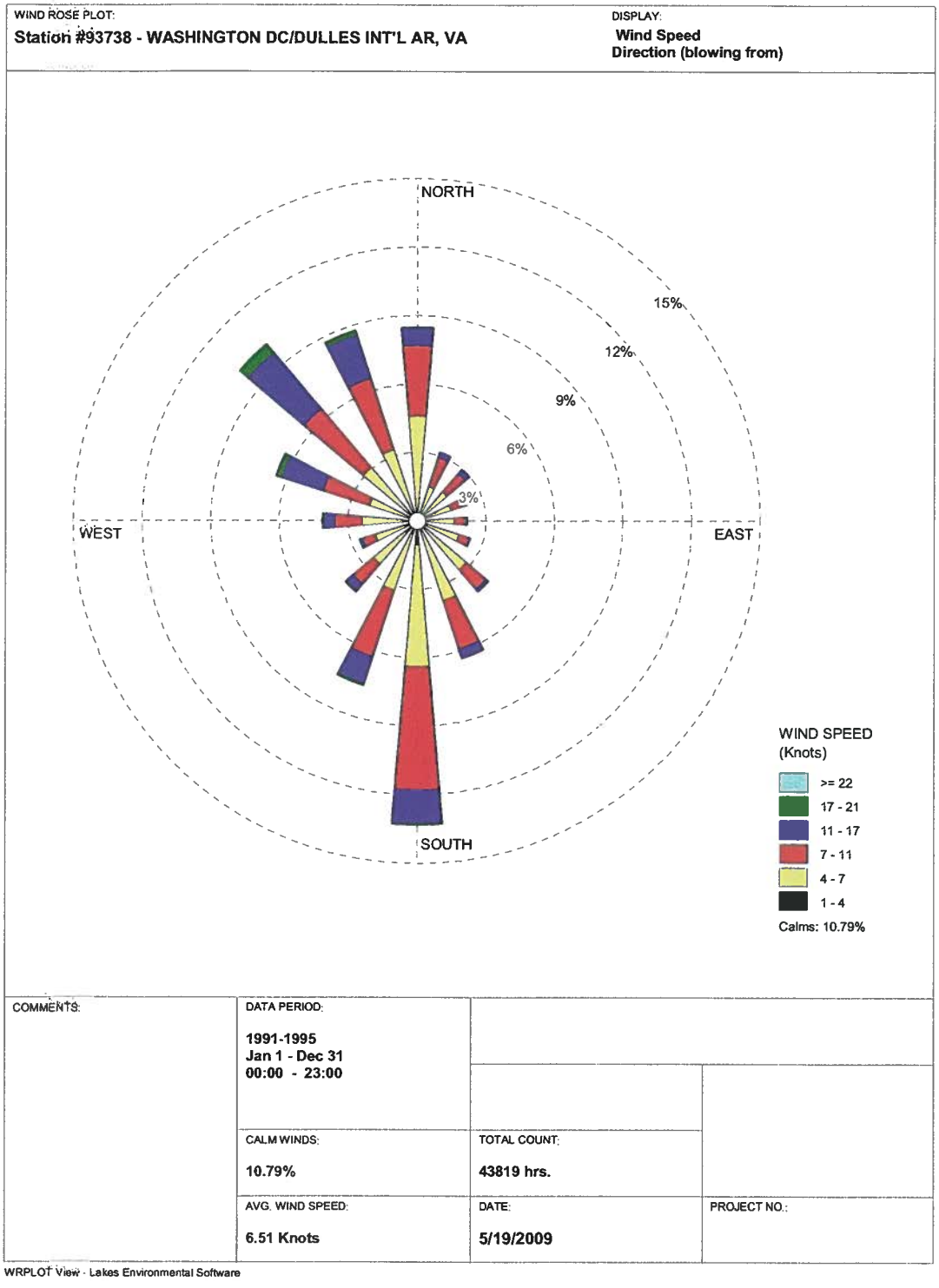


**Figure 4.1 Five-Year Composite Windrose for Washington Dulles International Airport**



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## CURRENT AIR QUALITY LEVELS

In evaluating the effect of any new air discharge on the community, it is essential to have a thorough understanding of the baseline or current air quality levels. By US EPA definition, this plant will be considered a major source for nitrogen oxides, PM-10 and carbon monoxide and a minor source for sulfur dioxide and volatile organic compounds. Potential emissions of nitrogen oxides, PM-10 and carbon monoxide are estimated to exceed 100 tons per year (tpy), the US EPA trigger level for the major designation in this case. Table 4.3 summarizes all measured air quality levels in Loudoun and Fairfax Counties.

The reader should note that there are different standards that apply to the same pollutant but for different averaging periods. For example, there are short term standards for the 24-hour averaging period, i.e., the highest 24-hour value measured for the entire year, and long term standards for the annual averaging period. The standards were established to recognize the air pollution effects over short term periods and long term periods. For the pollutant PM-10 (particulate matter with an aerodynamic diameter of 10 microns or less), the 24-hour standard is 150 micrograms per cubic meter ($\mu g/m^3$) and the annual standard is 50 $\mu g/m^3$.

**Table 4.3 Summary of Current Air Quality Levels Near the Plant Site**

| Pollutant | Averaging Period | Year | Location | Measured Concentration ($\mu g/m^3$) | US EPA and VA Ambient Std. ($\mu g/m^3$) |
|---|---|---|---|---|---|
| Carbon Monoxide | 1-hour | 2008 | Chantilly | 1,600 | 40,000 |
| | 8-hour | 2008 | Chantilly | 1,371 | 10,000 |
| Nitrogen Oxides | annual | 2008 | Cub Run Treatment Plant | 11.3 | 100 |
| Sulfur Dioxide | 3-hour | 2008 | Chantilly | 49.8 | 1,300 |
| | 24-hour | 2008 | Chantilly | 31.4 | 365 |
| | annual | 2008 | Chantilly | 5.2 | 80 |
| Particulate Matter-10 microns | 24-hour | 2008 | Chantilly | 42 | 150 |
| | annual | 2008 | Chantilly | 18 | 50 |
| Particulate Matter-2.5 microns | 24-hour | 2008 | Ashburn | 27.5 | 35 |
| | annual | 2008 | Ashburn | 11.2 | 15 |
| Ozone New Std. | 8-hour | 2008 | Chantilly | 215 | 160 |
| Ozone Old Std. | 1-hour | 2008 | Chantilly | 307 | 220 |

The data in the table show that the air quality in and around the Leesburg area is very good and well below the standards except for pollutant ozone that is mainly associated with traffic emissions from the metropolitan area.

The predicted pollutant concentrations from the dispersion model for the new plant can be added to the background or current air quality levels and subsequently compared to the air quality standards to determine the impact on the community (see Table 5.1).

**REGULATORY APPROVALS NEEDED FOR NEW PLANT**

The Virginia Department of Environmental Quality has responsibility for issuing air pollution permits for the Green Energy power plant. DEQ has been granted the permitting authority from the US EPA. US EPA still has an oversight role and is often called on to assist with complicated issues for a particular evaluation. A construction permit must be issued by the DEQ before the commencement of any construction activities at the site related to the air emissions sources. There are several different types of air analyses that must be completed in order to obtain the air permit for this facility:

- A prevention of significant deterioration (PSD) analysis is needed for nitrogen oxides, PM-10 and carbon monoxide since the emissions for those pollutants from the site are greater than 100 tpy;
- A new source review (NSR) analysis is needed to mitigate the metro ozone non-attainment issue for the ozone precursor pollutant nitrogen oxides; and
- A minor source permit will be needed for the other pollutants, i.e., sulfur dioxide and volatile organic compounds.

The PSD, NSR and minor source analyses can all be included in one document presented to the Virginia DEQ for approval to construct this facility. Because of the control measures proposed in this analysis and the negligible effects on the air quality beyond the property line, it is expected that the DEQ will be able to issue a permit for this plant.

Emission offsets for NOx will have to be obtained from other existing sources in the metropolitan Washington, DC area. The offsets can be secured with assistance from the DEQ on any "banked" emissions that exist for the Washington, DC area or from other facilities in the metro area that may choose to close their operations and sell their emissions credits to Green Energy. The US EPA Appendix S policy for obtaining emission offsets has been used on many occasions to facilitate growth in non-attainment areas.

There are as yet no DEQ or US EPA regulations that have been established to deal with greenhouse gas emissions from any industrial source. The current practice of "controlling" greenhouse gases is to select the process that minimizes emissions. A natural gas-fired power plant produces about 35% or less of the greenhouse gas emissions generated by a coal-fired power plant. We believe the regulatory agencies will accept the proposed natural gas power system as being the best fossil fuel-fired power system to mitigate greenhouse gas emissions.

## SECTION 5 – RESULTS OF ANALYSIS

The results of the ambient air quality and cooling tower analyses performed for the proposed Green Energy facility are provided in this section of the report.

### AMBIENT AIR QUALITY

An ambient air quality analysis was conducted using the US EPA-recommended AERMOD model. Table 5.1 presents the predicted pollutant concentrations for the appropriate averaging periods.

**Table 5.1 Maximum Predicted Pollutant Concentrations**

| Pollutant | Averaging Period | AERMOD-Maximum Predicted Concentration ($\mu g/m^3$) | Monitored Existing Background Concentration ($\mu g/m^3$) | Total Predicted Concentration ($\mu g/m^3$) | US EPA and VA Ambient Std. ($\mu g/m^3$) |
|---|---|---|---|---|---|
| CO | 1-hour | 15.4 | 1,600 | 1,615 | 40,000 |
| | 8-hour | 7.8 | 1,371 | 1,379 | 10,000 |
| NOx | Annual | 0.7 | 11.3 | 12.0 | 100 |
| $SO_2$ | 3-hour | 1.2 | 49.8 | 51.0 | 1,300 |
| | 24-hour | 0.7 | 31.4 | 32.1 | 365 |
| | Annual | 0.05 | 5.2 | 5.25 | 80 |
| PM-10 | 24-hour | 6.3 | 42 | 48.3 | 150 |
| | Annual | 0.4 | 18 | 18.4 | 50 |

Note: For short-term averaging periods (24-hours or less), compliance is based on the second-highest concentration predicted by AERMOD. For long-term averaging periods (annual), compliance is based on the highest concentration predicted by AERMOD.

The receptor grid used in this modeling analysis consists of several receptors along the property boundary and a polar grid with receptor points placed on each 10° radial up to a distance of 2,500 meters. About 500 receptors were used in this analysis to assure that the maximum concentrations had been identified in the study area. The above modeling results reflect the maximum predicted concentrations anywhere within the modeled receptor grid. The maximum predicted concentrations were found to occur at or near the property boundary toward the southeast. The only exception was the 1-hour average concentration for CO, which was found to occur at a short distance from the property boundary to the northeast. As shown above, all of these concentrations are well within the US EPA and Virginia ambient standards.

The expected concentrations from this new plant are indeed minimal. At the point of maximum concentration with the background level included, the resulting impacts from the new plant will be well below all air quality standards. These predicted values from the plant are considered insignificant by the US EPA definition, which should allow for timely approval of the project. A visual comparison of the maximum impact plus background concentration compared to the air quality standard is presented in Figure 5.1

for the pollutant NOx. Figure 5.2 illustrates the same comparison for PM-10 at the point of maximum concentration, which is close to the southeast property line.

The US EPA and VA DEQ have not defined the permitting or modeling process for the evaluation of the pollutant PM-2.5 for which there is a newly adopted 24-hour air quality standard. Even if all of the particles emitted from the stacks were assumed to be smaller than 2.5 microns, the proposed plant's impact would be in compliance with the new standard, i.e., 6.3 $\mu g/m^3$ maximum predicted concentration plus 27.5 $\mu g/m^3$ background level yields a maximum concentration of 33.8 $\mu g/m^3$, which is still below the standard of 35 $\mu g/m^3$. This we believe would be the worst-case assumption for evaluating PM-2.5 compliance.

No mathematical modeling is needed for single point sources like this facility when evaluating ozone levels in metropolitan areas. Regulatory agencies simply require that the lowest achievable emission rate control technology be used and emission offsets be obtained to secure approval.

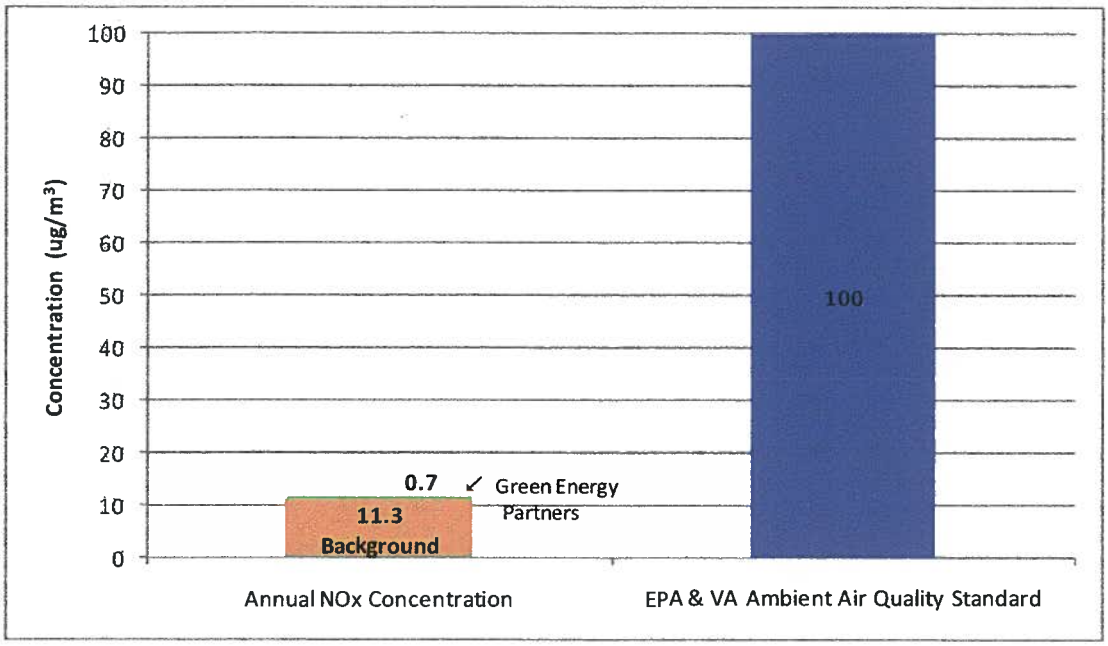
In addition to the above receptor grid, two receptors were also placed at the Leesburg and Old Ashburn town centers. The purpose of these receptors was to assess the plant's effect on air quality in these surrounding communities. The concentrations of all modeled pollutants at these two locations were a small fraction of the maximum concentrations listed in Table 5.1. For example, the highest annual average NOx concentration at these receptors is approximately 0.02 $\mu g/m^3$ compared to the maximum concentration of 0.7 $\mu g/m^3$ near the plant. Similarly, the second-highest 24-hour average PM-10 concentration at these two receptors is approximately 0.1 $\mu g/m^3$ compared to 6.3 $\mu g/m^3$ near the plant. These concentrations are considered to be insignificant by the US EPA and as such are not required to be considered as part of the air permitting process because of their miniscule effect on air quality. Therefore, the plant will have an imperceptible effect on air quality in the surrounding communities.

Figures 5.1 and 5.2 provide results for the two pollutants and averaging periods with maximum predicted concentrations that come closest to the air quality standards. For the other criteria pollutants, the maximum predicted concentrations are much lower in comparison to the air quality standards.

## COOLING TOWER ANALYSIS

The SACTI model was applied to assess the potential for occurrence of ground-level fogging and icing, visible plumes, and particle deposition in the area surrounding the proposed cooling tower. The SACTI plume model uses probability theory to predict the length of the plume. As expected, the likelihood of each of these occurrences decreases with increasing distance from the source. Therefore, the greatest probability of occurrence of any of these events is close to the cooling tower.

**Figure 5.1 Predicted Nitrogen Oxides Concentration at Property Lines (Maximum for Study Area)**



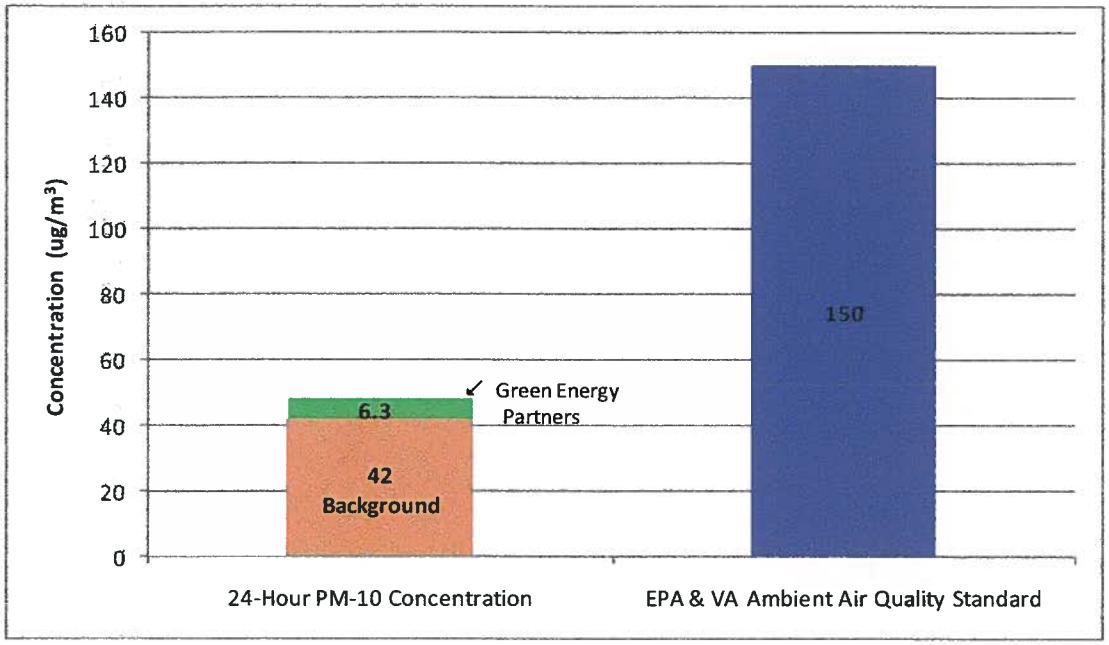

Ground-Level Fog

For ground-level fogging, the SACTI model estimated that within a distance of 100 meters (328 feet) in any direction from the cooling tower, there could be a total of 150 hours of fogging during the modeled five-year period, or 30 hours per year. However, since the distance from the cooling towers to the property boundary is greater than 100 meters in all directions, a majority of these fogging events would be limited to the plant property. The maximum number of fogging occurrences beyond the property boundary is predicted to be less than 7 hours per year at locations near the northeastern boundary of the plant. Similarly, the maximum number of ground-level icing occurrences beyond the property boundary is predicted to be less than 1 hour per year at locations near the northeastern boundary of the plant. Beyond a short distance from the property boundary, the number of fogging and icing events decreases rapidly with distance.

Visible Plumes

A visible water vapor plume will occur virtually at all times that the plant is operating. Of paramount importance with the visible plume are the occurrences that would linger beyond the property line and, therefore, cause a shadowing effect on the surrounding area. There are no environmental regulations that limit shadowing or plume length. However, it is fair to assess whether such impacts could occur for the proposed cooling tower.

**Figure 5.2 Predicted PM-10 Concentration at Property Lines (Maximum for Study Area)**




As with ground-level fogging, the majority of the occurrences of elevated visible plumes is limited to the plant property. For example, the SACTI model predicts that elevated plumes may be visible at a distance of 100 meters in any direction from the cooling tower for a total of 100 hours over five years, or 20 hours per year. However, beyond the property boundary, the probability of occurrence of elevated visible plumes decreases rapidly with increasing distance. Within a distance of 300 meters (about 1,000 feet) from the cooling tower, the SACTI model predicts that the occurrence of elevated visible plumes drops to less than one hour per year at any given location. Finally, the model predicts that there could be a visible plume at the end of the Leesburg airport for 8 minutes per year.

Under certain meteorological conditions, the plume could rise to an elevation of 500 feet. This condition is expected to occur 4 hours per year according to the SACTI model. The typical elevation above ground level at the top of the visible plume is expected to be about 150 feet.

Particle Deposition

The SACTI model predicts that there is no probability of solids deposition occurring due to the cooling tower emissions, which are well controlled with a highly efficient drift (mist) eliminator. Because of the mist eliminator, there are no water droplets of such size that would fall in the plant or anywhere in the surrounding communities. Water droplets contain particles that if deposited could have an effect on vegetation and other property.

The cooling tower planned for the Green Energy project will not result in water droplets falling on surrounding communities.

The tiny water droplets that pass through the mist eliminator contain the same fraction of solids or dissolved particles found in the recirculated cooling tower water. Once these water droplets are emitted, they act like gases (fully suspended) and travel with the wind. Eventually, the droplets evaporate and the suspended particles are transported farther downwind. All particles emitted into the atmosphere eventually return to the earth; most are "washed out" or combine with other particles and gravitate to the earth. This process takes many days to complete. The volcanic ash (dust particles) emitted from Mt. St. Helens reportedly circled the globe for ten years.

Findings

As described above, the probability of occurrence of any adverse effects from the cooling tower plumes on the surrounding communities is negligible.

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**POWERGEM**

Power Grid Engineering & Markets



# ***Leesburg Generation Study***

**Prepared for**

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**Submitted by**

**Scott Gass**
**Principal Consultant**

**Date – 7/7/09**

A-323

**POWERGEM**

Power Grid Engineering & Markets

## Purpose of Study

A study was completed to determine the benefits to the local transmission system for the addition of a 980 MW (at ISO) generator located at the proposed Green Energy Partners / Stonewall power park in Leesburg, VA. The generator will interconnect to the Dominion Virginia Power system through a new six breaker 230 kV ring bus located about 1 mile south of the existing Pleasant View 230 kV substation. Diagram 1 shows the proposed new substation interconnection as of the 2012 PJM RTEP.

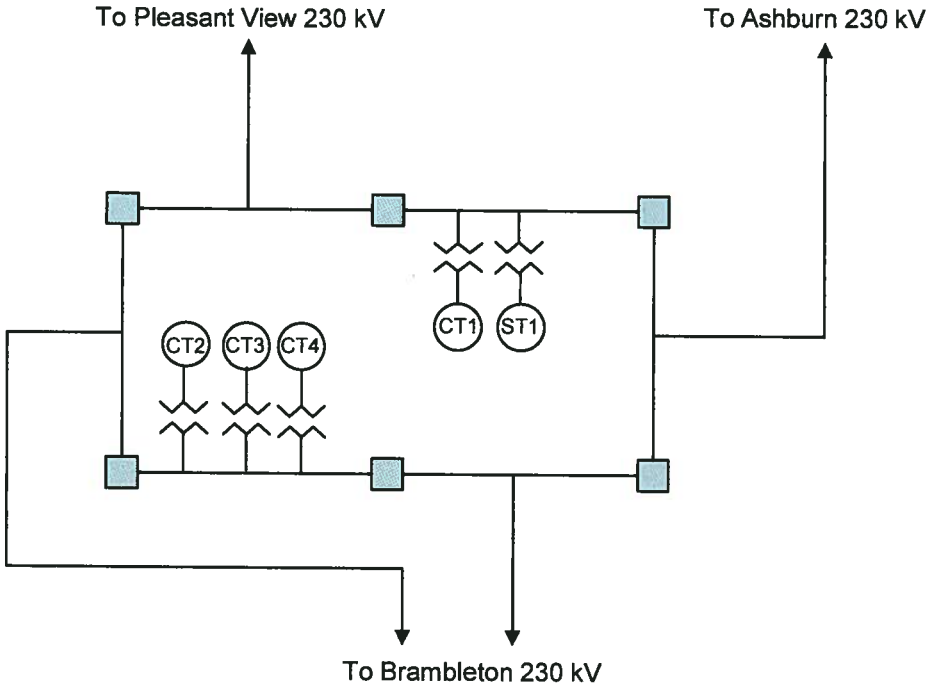


Diagram 1

## System Model and Analysis Description

The PJM RTEP 2012 basecase and associated contingency files were used for this study. The starting 2012 model contained both the proposed TrAIL and PATH lines but did not include the MAPP project. A sensitivity analysis was completed with the PATH project removed from the model.

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When the new 980 MW generator was modeled, two different generation displacement scenarios were studied. Scenario 1 assumed a reduction in Mt. Storm generation (baseload coal) by 300 MW, Remington generation (CT peaker) by 150 MW, Chesterfield generation (baseload coal) by 200 MW, Possum Pt. generation (baseload coal) by 150 MW, Chalk Point generation (coal) by 130 MW and Dickerson generation (baseload coal) by 50 MW. Scenario 2 assumed a uniform reduction of all generators over 75 MW's in BG&E, Dominion, PEPCO and APS.

## Summary of Results

### Local Benefits

The three major sources of power into Loudoun County are the Loudoun 500/230 kV #1 and #2 transformers, the Pleasant View 500/230 kV transformer and the Gainesville – Loudoun 230 kV circuit. These three sources/substations combined supply over 2400 MW of power into Loudoun County in the PJM peak summer 2012 model. The addition of the 980 MW generator resulted in a significant reduction in the flows on all three major sources of power into Loudoun County as shown in Exhibit 1. Notice that the local benefit was similar for either generation displacement scenario 1 or 2.

| Key Transmission Facilities | 2012 System Without 980 MW Generator | New Generator Displacement Scenario 1 | % Change | New Generator Displacement Scenario 2 | % Change |
|---|---|---|---|---|---|
| Loudoun 500/230 kV 1 & 2 | 1187 MW | 991 MW | -17% | 978 MW | -18% |
| Pleasant View 500/230 kV | 763 MW | 572 MW | -25% | 564 MW | -26% |
| Gainesville - Loudoun 230 kV | 454 MW | 347 MW | -24% | 362 MW | -20% |
| Totals | 2404 MW | 1910 MW | -21% | 1904 MW | -21% |

Exhibit 1 – 2012 Model with TrAIL and PATH

A sensitivity analysis was performed by removing the proposed PATH circuit from the PJM 2012 RTEP model. The results are shown in Exhibit 2. The benefits provided by the new 980 MW generator are similar both with and without the PATH project.

| Key Transmission Facilities | 2012 System Without 980 MW Generator | New Generator Displacement Scenario 1 | % Change | New Generator Displacement Scenario 2 | % Change |
|---|---|---|---|---|---|
| Loudoun 500/230 kV 1 & 2 | 1201 MW | 1014 MW | -16% | 1001 MW | -17% |
| Pleasant View 500/230 kV | 745 MW | 551 MW | -26% | 543 MW | -27% |
| Gainesville - Loudoun 230 kV | 519 MW | 413 MW | -20% | 427 MW | -18% |
| Totals | 2465 MW | 1978 MW | -20% | 1971 MW | -20% |

Exhibit 2 – 2012 Model with Trail (PATH Project Removed)

The addition of a 980 MW generator was also modeled in the PJM 2013 RTEP basecase. The 2013 model contained the proposed TrAIL, PATH and MAPP projects. Similar local benefits (see Exhibit 3) were obtained with both the 2012 and 2013 model.

| Key Transmission Facilities | 2013 System Without 980 MW Generator | New Generator Displacement Scenario 1 | % Change | New Generator Displacement Scenario 2 | % Change |
|---|---|---|---|---|---|
| Loudoun 500/230 kV 1 & 2 | 1233 MW | 1044 MW | -15% | 1030 MW | -17% |
| Pleasant View 500/230 kV | 791 MW | 627 MW | -21% | 620 MW | -22% |
| Gainesville - Loudoun 230 kV | 480 MW | 377 MW | -22% | 392 MW | -18% |
| Totals | 2504 MW | 2048 MW | -18% | 2042 MW | -18% |

Exhibit 3 – 2013 Model with TrAIL, PATH and MAPP

In all of the system models that were studied the Green Energy Partners / Stonewall proposed 980 MW generator resulted in a large reduction (between 18% and 21%) in reliance on external power to be delivered through the transmission system to serve the load in the Loudoun County and Leesburg area.

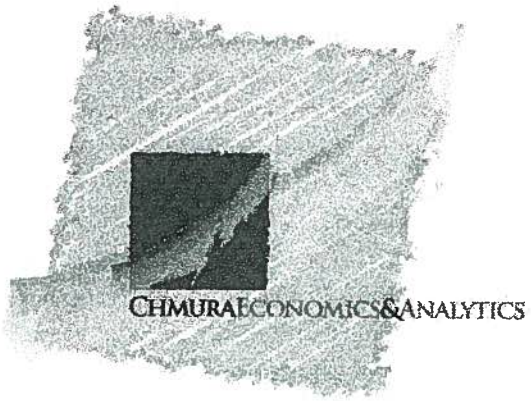
## Regional Benefits

There are also some regional benefits, in addition to the local benefits, provided by the proposed 980 MW generator. The three 500 kV circuits shown in Exhibit 4 were selected to illustrate the larger regional benefit provided by the new 980 MW generator. The Pruntytown – Mt. Storm 500 kV and Mt. Storm – Doubs 500 kV circuits have been key indicators for determining the need for the TrAIL and PATH projects. The Meadowbrook – Loudoun 500 kV circuit is the eastern most section of the proposed TrAIL project. In general, the results indicate a 4% to 6% reduction of flows on these key 500 kV facilities. The one exception was the flows on Pruntytown – Mt. Storm 500 kV for the generation displacement scenario 1. The increase in flows for this case are directly attributable to the 300 MW reduction in generation at Mt. Storm.

| Key Transmission Facilities | 2012 System Without 980 MW Generator | New Generator Displacement Scenario 1 | % Change | New Generator Displacement Scenario 2 | % Change |
|---|---|---|---|---|---|
| Mt. Storm - Doubs 500 kV | 1618 MW | 1541 MW | -5% | 1556 MW | -4% |
| Pruntytown - Mt. Storm 500 kV | 1594 MW | 1635 MW | 3% | 1536 MW | -4% |
| Meadowbrook - Loudoun 500 kV | 1210 MW | 1133 MW | -6% | 1133 MW | -6% |
| Totals | 4422 MW | 4309 MW | -3% | 4225 MW | -5% |

Exhibit 4 – 2012 Model with TrAIL and PATH

November 12, 2009




# The Economic and Fiscal Benefit of a Proposed Energy Generating Plant in Loudoun County, Virginia

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A-327

A new electrical energy park is proposed in Loudoun County, which is located in Northern Virginia. The station will feature a combined cycle generating unit consisting of two natural gas generators, two heat-recovery steam systems, and one steam-turbine generator.[1] In addition, two peak power gas generators and a solar array are included in the proposal.

The economic benefit of a power station on a local economy occurs in two phases. The first takes place during the construction of the facility, which is expected to occur over 30 months from January 2012 to June 2014. The second phase is the ongoing operation of the generating station, which is expected to commence in the summer of 2014. In both cases, the direct, indirect, and induced impacts[2] in spending and job creation are estimated. Chmura uses IMPLANPro® models to simulate the economic impact of this project. In addition, tax revenues are estimated for Loudoun County and the Commonwealth of Virginia for the next 20 years.

The preliminary estimate of the total cost of the proposed power station is $829 million. Among those, 20% is expected to be spent on soft costs such as architecture and engineering services, as well as other professional services.[3] For the remaining $663 million, 62% will be spent on equipment and materials while the remaining 38% is expected to be spent on the construction of the structure.[4]

Although regional firms will be used whenever possible, not every product and service needed for the construction and operation of the generating station is available in Loudoun County or in Virginia. Consequently, some of the services and products will be purchased from firms located outside the region. Chmura uses the IMPLANPro® model to estimate the percentage of demand that is expected to be met locally.

## Economic Benefit on Loudoun County

Table 1 details the estimated economic impact of the utility plant on Loudoun County. From January 2012 to June 2014, it is estimated that the construction of the proposed utility plant will generate an annual average of $127.8 million in direct economic impact in Loudoun County. This will directly create an average of 844 jobs per year during the construction period, with the majority of them in construction trades. The indirect impacts in Loudoun County are expected to total $23.1 million and create 132 jobs

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[1] Green Energy Partners/Stonewall, LLC, c/o Andrews Community Investment Corporation contracted Chmura Economics & Analytics, LLC (Chmura) to conduct an analysis of the economic and fiscal impact of the construction and the operation of this generating station on Loudoun County and the Commonwealth of Virginia.

[2] Direct impact is defined as economic activity generated by the project under consideration. Indirect impact is the secondary economic activity that is generated by the project. The induced impact is economic activity (such as retail sales, spending at restaurants and professional offices) generated when the workers at the power station and their suppliers spend their income.

[3] Source: Chmura Impact Study of Bear Garden Plant in Buckingham County, Virginia. Since the two plants are the same size, the construction and operation assumptions for the Loudoun plant are the same as those in the Bear Garden study.

[4] Source: Chmura Impact Study of Bear Garden Plant in Buckingham County, Virginia.

per year during the construction phase in firms supporting the industry such as site preparation and transportation. The induced impacts are expected to produce $32.2 million in sales that support 229 jobs per year in the county during the construction period. The induced jobs are concentrated in consumer service-related industries such as restaurants, professional offices, and retail stores. On average, the construction of the generating station is expected to inject an annual $183.1 million into Loudoun economy and create 1205 jobs in the county.

Table 1: Economic Benefit of Utility Plant on Loudoun County

| Year | | Direct | Indirect | Induced | Total Benefit |
|---|---|---|---|---|---|
| One-Time Construction | | | | | |
| 2012 | Spending ($Million) | $153.3 | $27.8 | $38.7 | $219.8 |
| | Employment | 1,013 | 158 | 275 | 1,446 |
| 2013 | Spending ($Million) | $153.3 | $27.8 | $38.7 | $219.8 |
| | Employment | 1,013 | 158 | 275 | 1,446 |
| 2014 | Spending ($Million) | $76.7 | $13.9 | $19.3 | $109.9 |
| | Employment | 507 | 79 | 137 | 723 |
| Annual Average | Spending ($Million) | $127.8 | $23.1 | $32.2 | $183.1 |
| | Employment | 844 | 132 | 229 | 1,205 |
| Ongoing Operation | | | | | |
| 2014 Onward | Spending | $18.4 | $3.2 | $2.1 | $23.6 |
| | Employment | 25 | 14 | 14 | 54 |

Note: Numbers may not sum due to rounding
Source: IMPLAN Pro 2007, Chmura Bear Garden Study

From Summer 2014 onward, the economic impact of the proposed utility plant will come from its ongoing operation. The station is expected to hire 25 permanent employees.[5] For ongoing operations, IMPLAN sector 31 is used to simulate the economic effect—sector 31 corresponds to the North America Industry Classification System (NAICS) code 2211: electric power generation, transmission and distribution.

The total annual economic impact (direct, indirect, and induced) of the ongoing operation of the plant in Loudoun County is estimated to be $23.6 million (measured in 2014 dollars) and can support 54 jobs. In terms of direct impact, the on-going operation of the generating station is estimated to have annual gross revenues of $18.4 million[6] while employing 25 workers. An additional indirect impact of $3.2 million and 14 jobs will benefit Loudoun County businesses that support the utility plant operation. The number of jobs created due to the induced impact amounts to 14 with associated annual spending of $2.1 million.

[5] Source: Chmura Bear Garden Economic Impact Study.

[6] The direct spending figure is representative of gross sales of the generating station estimated by the IMPLAN model. The model treats the facility as a stand-alone business. As a result, the $14.5 million includes spending on labor, equipment, fuel inputs, and profits.

This impact is mostly created when generation station workers spend their incomes at restaurants, doctor's offices, and retail establishments.

## Economic Benefit on State of Virginia

The economic impact of the proposed utility plant on Virginia is larger than that on Loudoun, because businesses outside of Loudoun County can also benefit from the construction and operation of the plant. During the construction phase of the generating station, the entire state of Virginia (Table 2) is expected to see a direct economic impact of $127.8 million per year from 2012 to 2014. This will create 844 jobs per year during the construction phase, with the majority of them in construction trades. The indirect impact in Virginia is expected to total $31.8 million per year and create 182 jobs during the construction phase in firms supporting construction such as site preparation and truck transportation. The induced impact is expected to total over $45.6 million with 312 jobs per year in the state during the construction phase. Those jobs are concentrated in consumer service-related industries such as restaurants, professional offices, and retail stores. Overall, the construction of the generating station is expected to inject $205.2 million into Virginia's economy and create 1,339 jobs per year during construction.

Table 2: Economic Benefit of Utility Plant on Virginia

| Year | | Direct | Indirect | Induced | Total Benefit |
|---|---|---|---|---|---|
| One-Time Construction | | | | | |
| 2012 | Spending ($Million) | $153.3 | $38.1 | $54.8 | $246.2 |
| | Employment | 1,013 | 218 | 375 | 1,607 |
| 2013 | Spending ($Million) | $153.3 | $38.1 | $54.8 | $246.2 |
| | Employment | 1,013 | 218 | 375 | 1,607 |
| 2014 | Spending ($Million) | $76.7 | $19.1 | $27.4 | $123.1 |
| | Employment | 507 | 109 | 187 | 803 |
| Annual Average | Spending ($Million) | $127.8 | $31.8 | $45.6 | $205.2 |
| | Employment | 844 | 182 | 312 | 1,339 |
| Ongoing Operation | | | | | |
| 2014 Onward | Spending | $18.4 | $3.2 | $3.0 | $24.6 |
| | Employment | 25 | 23 | 31 | 78 |

Note: Numbers may not sum due to rounding
Source: IMPLAN Pro 2007,and Chmura Bear Garden Study

The statewide total economic impact (direct, indirect, and induced) of the ongoing operation of the generating station is estimated to be $24.6 million and support 78 jobs per year in Virginia. In terms of direct impact, the on-going operation of the utility plant is estimated to have annual gross revenues of $18.4 million and employ 25 workers. Indirect impacts of $3.2 million and 23 jobs are expected to benefit Virginia businesses that support the plant operation. The number of jobs created due to the induced impact amounts to 31 with associated annual spending of $3.0 million. The beneficiaries are mostly restaurants, professional offices, and retail establishments.

Table 3 summarizes the economic benefit of the project on Loudon County and Virginia in the next 20 years.

Table 3: Economic Benefit by Year

| | Loudon Economic Impact | | Virginia Economic Impact | |
|---|---|---|---|---|
| Year | Spending ($Million) | Jobs | Spending ($Million) | Jobs |
| 2012 | $219.8 | 1,446 | $246.2 | 1,607 |
| 2013 | $219.8 | 1,446 | $246.2 | 1,607 |
| 2014 | $121.7 | 750 | $225.7 | 842 |
| 2015 | $23.6 | 54 | $24.6 | 78 |
| 2016 | $23.6 | 54 | $24.6 | 78 |
| 2017 | $23.6 | 54 | $24.6 | 78 |
| 2018 | $23.6 | 54 | $24.6 | 78 |
| 2019 | $23.6 | 54 | $24.6 | 78 |
| 2020 | $23.6 | 54 | $24.6 | 78 |
| 2021 | $23.6 | 54 | $24.6 | 78 |
| 2022 | $23.6 | 54 | $24.6 | 78 |
| 2023 | $23.6 | 54 | $24.6 | 78 |
| 2024 | $23.6 | 54 | $24.6 | 78 |
| 2025 | $23.6 | 54 | $24.6 | 78 |
| 2026 | $23.6 | 54 | $24.6 | 78 |
| 2027 | $23.6 | 54 | $24.6 | 78 |
| 2028 | $23.6 | 54 | $24.6 | 78 |
| 2029 | $23.6 | 54 | $24.6 | 78 |
| 2030 | $23.6 | 54 | $24.6 | 78 |
| 2031 | $23.6 | 54 | $24.6 | 78 |
| 2032 | $23.6 | 54 | $24.6 | 78 |
| 2033 | $23.6 | 54 | $24.6 | 78 |
| 2034 | $23.6 | 54 | $24.6 | 78 |
| 2035 | $23.6 | 54 | $24.6 | 78 |

Source: Chmura Economics & Analytics

## Tax Revenues for Local and State Government

The presence of the proposed utility plant in Loudoun County will also bring in tax revenues for county and state governments. In order to be conservative, only tax revenue from the direct impact is estimated in this section.[7]

[7] This approach is recommended by Burchell and Listokin in *The Fiscal Impact Handbook*.

During the construction phase from 2012 to 2014, the business, professional, and occupational license (BPOL) tax is collected for Loudon County, and individual and corporate income taxes are collected for state government.

After the power plant is in operation, Virginia government is expected to receive $0.5 million per year in income tax from individuals employed by the plant as well as corporate income tax from its operation.

Loudoun County will receive real estate taxes based on a tax rate of $1.245 per $100 assessed value[8]. The assessed value of the property includes the land and the structure. The value of the structure is assumed to be the construction cost of the structure and is assumed to remain constant for the next 20 years.[9] The value of the land is currently $36 million, and is assumed to appreciate 4% per year. As a result, the annual average real estate tax is estimated to be over $5 million per year.

The equipment in the plant will be subject to the county manufacturing machinery and tool tax, at a rate of $2.75 per $100 assessed value. Loudoun County uses the following depreciation schedule to assess the taxable value of the equipment:

- 50% of the original cost for the first year in use,
- 40%, 30%, 20% of the original cost for years two through four of usage, and
- 10% of the original cost, thereafter.[10]

As a result, the machine tool tax is estimated to be $5.6 million for the first year in use, $4.5 million for the second year in use, $3.4 million for the third year use, $2.3 million for the fourth year in use, and $1.1 million for the fifth year and after.

Based on the Table 4, which lists local and state tax revenue by year, Loudoun County will receive the largest amount of tax revenue in 2015, estimated at $10.8 million. Due to the depreciation of the equipment, county tax revenue will decrease afterwards and remain at around $7 million per year after 2019. State tax revenue will be highest in 2012, as hundreds of jobs will be created during construction. After 2015, state tax revenue will stabilize at $0.5 million per year.

---

[8] This is the rate for 2010. Chmura uses this rate for all future years, even though the real estate tax rate may change in the future.

[9] Chmura spoke with county assessor's office regarding the assessed value. The assessed value will vary depending on the location of the project, as well as market condition. So this estimate can only be interpreted as a baseline estimate.

[10] Source: Loudon County website at http://www.loudoun.gov.

| Table 4: Fiscal Benefit by Year | | |
|---|---|---|
| Year | Loudoun Tax | Virginia Tax |
| 2012 | $0.8 | $3.7 |
| 2013 | $0.8 | $3.7 |
| 2014 | $6.1 | $2.1 |
| 2015 | $10.8 | $0.5 |
| 2016 | $9.7 | $0.5 |
| 2017 | $8.6 | $0.5 |
| 2018 | $7.5 | $0.5 |
| 2019 | $6.9 | $0.5 |
| 2020 | $6.9 | $0.5 |
| 2021 | $7.0 | $0.5 |
| 2022 | $7.0 | $0.5 |
| 2023 | $7.0 | $0.5 |
| 2024 | $7.1 | $0.5 |
| 2025 | $7.1 | $0.5 |
| 2026 | $7.1 | $0.5 |
| 2027 | $7.1 | $0.5 |
| 2028 | $7.2 | $0.5 |
| 2029 | $7.2 | $0.5 |
| 2030 | $7.2 | $0.5 |
| 2031 | $7.3 | $0.5 |
| 2032 | $7.3 | $0.5 |
| 2033 | $7.4 | $0.5 |
| 2034 | $7.4 | $0.5 |
| 2035 | $7.4 | $0.5 |
| Source: Chmura Economics & Analytics | | |

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Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2612-OE

Issued Date: 10/05/2009



David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Structure A |
| Location: | Leesburg, VA |
| Latitude: | 39-03-28.03N NAD 83 |
| Longitude: | 77-32-32.29W |
| Heights: | 100 feet above ground level (AGL)<br>435 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-335

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2612-OE.

**Signature Control No: 649187-119180675** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-336

## Case Description for ASN 2009-AEA-2612-OE

Combustion turbine and associated building with mechanical for proposed power plant.



A-337

**TOPO Map for ASN 2009-AEA-2612-OE**



A-338

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2613-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Structure B |
| Location: | Leesburg, VA |
| Latitude: | 39-03-26.61N NAD 83 |
| Longitude: | 77-32-32.73W |
| Heights: | 100 feet above ground level (AGL)<br>435 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-339

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2613-OE.

**Signature Control No: 649188-119180667** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-340

## Case Description for ASN 2009-AEA-2613-OE

Combustion turbine and associated building with mechanical for proposed power plant.



A-341

**TOPO Map for ASN 2009-AEA-2613-OE**



A-342

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2614-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Stack Structure C |
| Location: | Leesburg, VA |
| Latitude: | 39-03-26.71N NAD 83 |
| Longitude: | 77-32-35.45W |
| Heights: | 160 feet above ground level (AGL)<br>495 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-343

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2614-OE.

**Signature Control No: 649189-119180674** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-344

160-foot tall structure associated with proposed power plant.



A-345

**TOPO Map for ASN 2009-AEA-2614-OE**



A-346

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2615-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Stack Structure D |
| Location: | Leesburg, VA |
| Latitude: | 39-03-28.14N NAD 83 |
| Longitude: | 77-32-35.05W |
| Heights: | 160 feet above ground level (AGL)<br>495 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-347

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2615-OE.

**Signature Control No: 649190-119180672** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-348

160-foot tall structure associated with proposed power plant.

**TOPO Map for ASN 2009-AEA-2615-OE**



A-350

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2616-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Stack Structure E |
| Location: | Leesburg, VA |
| Latitude: | 39-03-29.13N NAD 83 |
| Longitude: | 77-32-32.56W |
| Heights: | 120 feet above ground level (AGL) |
| | 455 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-351

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2616-OE.

**Signature Control No: 649191-119180668** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-352

120-foot tall structure associated with proposed power plant.

**TOPO Map for ASN 2009-AEA-2616-OE**



A-354

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2617-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Stack Structure F |
| Location: | Leesburg, VA |
| Latitude: | 39-03-30.51N NAD 83 |
| Longitude: | 77-32-32.13W |
| Heights: | 120 feet above ground level (AGL)<br>455 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2617-OE.

**Signature Control No: 649192-119180673** ( DNE )
Donna ONeill
Specialist

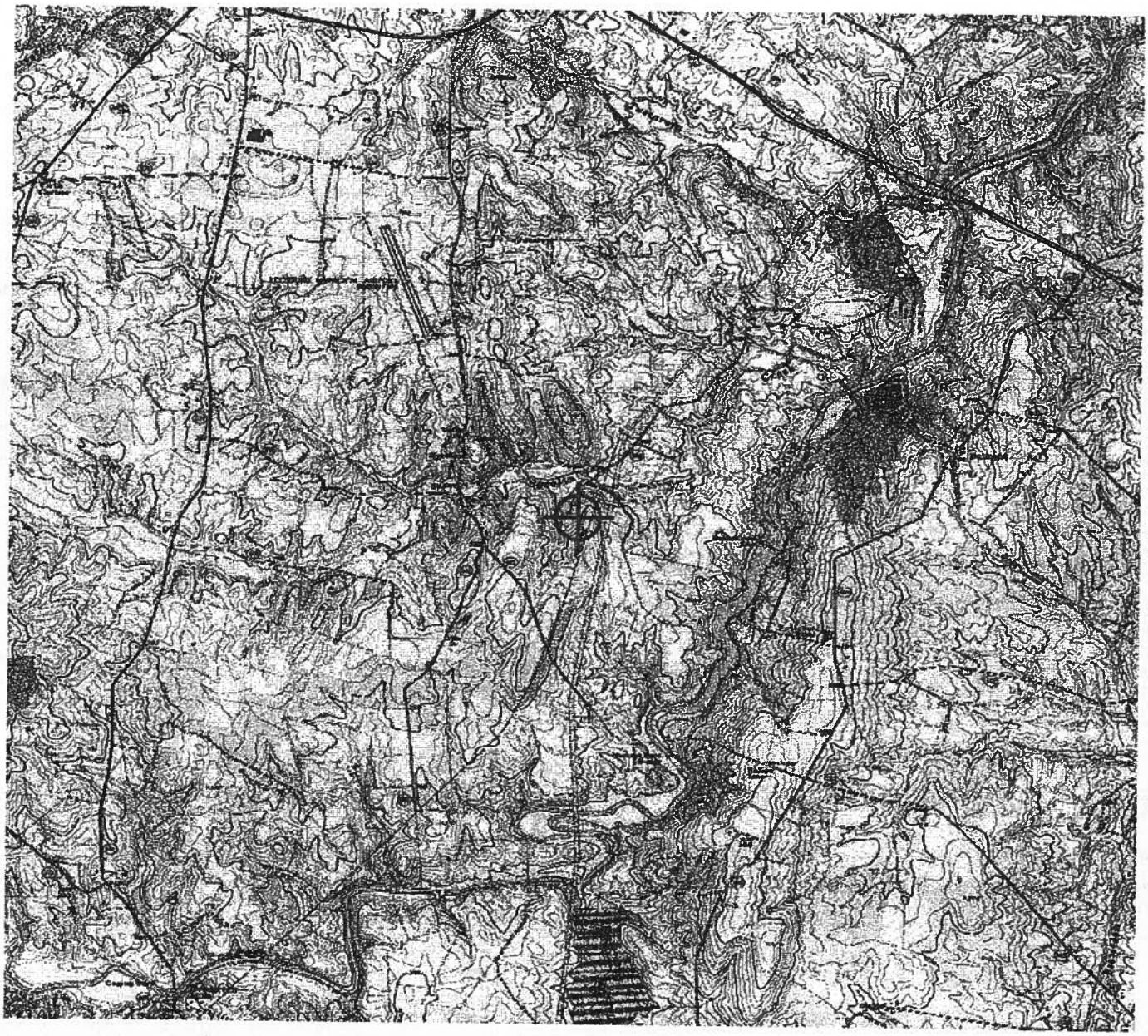
Attachment(s)
Case Description
Map(s)



A-356

120-foot tall structure associated with proposed power plant.

**TOPO Map for ASN 2009-AEA-2617-OE**





A-358

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2618-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Structure G |
| Location: | Leesburg, VA |
| Latitude: | 39-03-25.50N NAD 83 |
| Longitude: | 77-32-35.09W |
| Heights: | 100 feet above ground level (AGL)<br>435 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2618-OE.

**Signature Control No: 649193-119180669** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-360

## Case Description for ASN 2009-AEA-2618-OE

Steam turbine and associated building with mechanical for proposed power plant.



A-361

**TOPO Map for ASN 2009-AEA-2618-OE**



A-362

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2619-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Structure H |
| Location: | Leesburg, VA |
| Latitude: | 39-03-39.24N NAD 83 |
| Longitude: | 77-32-30.73W |
| Heights: | 100 feet above ground level (AGL)<br>410 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-363

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2619-OE.

**Signature Control No: 649194-119180670** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-364

**Case Description for ASN 2009-AEA-2619-OE**

Cooling Tower and associated building with mechanical for proposed power plant.



A-365

**TOPO Map for ASN 2009-AEA-2619-OE**



A-366

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AEA-2620-OE

Issued Date: 10/05/2009

David Wallen
William H. Gordon Associates, Inc.
301 North Mildred Street
Charles Town, WV 25414

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

| | |
|---|---|
| Structure: | Structure I |
| Location: | Leesburg, VA |
| Latitude: | 39-03-38.83N NAD 83 |
| Longitude: | 77-32-28.89W |
| Heights: | 100 feet above ground level (AGL)<br>396 feet above mean sea level (AMSL) |

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be completed and returned to this office any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part I)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 04/05/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.



A-367

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (816) 329-2525. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AEA-2620-OE.

**Signature Control No: 649195-119180671** ( DNE )
Donna ONeill
Specialist

Attachment(s)
Case Description
Map(s)



A-368

## Case Description for ASN 2009-AEA-2620-OE

Water treatment system and water tanks associated with proposed power plant.

**TOPO Map for ASN 2009-AEA-2620-OE**



A-370